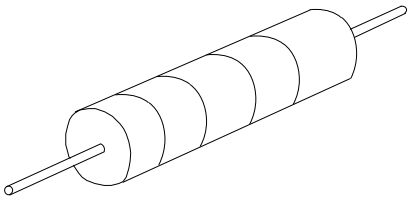
PROCEDURE

This experiment consists of two parts. In the first part, you will test Ohm's Law using a standard resistor and in the second part you will test it using a small light bulb. Before starting, make sure you understand the steps involved and you have all the items required. If you have any question or concern, please contact your tutor.

Resistors

The ability to control current flow and voltages within parts of a circuit is important. A common element used in circuits for this purpose is the resistor, which is available in various resistance values and in various power dissipation ratings. Resistors have a resistive material inside them and often have colour bands around them to indicate their resistance value. Wires, in general, may be thought of as having very little resistance, and almost all of the resistance of most circuits comes from that of the components. Even components such as batteries and light bulbs have measurable resistance.



Testing the multimetre

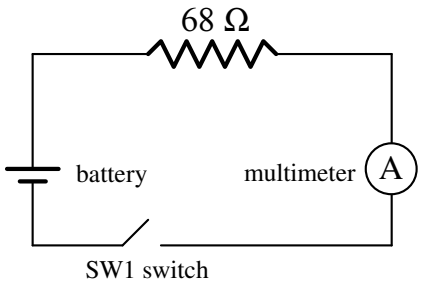
1. Locate the multimetre in the lab kit, along with a red and a black test lead. The leads have a wide (or banana) plug on one end and a clip on the other end. Insert the banana plug of the black lead into the jack marked **COM** and the red plug into the jack marked **Ω**. Connect the clips across one of the resistors on the circuit board. Turn the multimetre dial to the **Ohm Ω** setting. Make sure that the resistance value measured by the multimetre agrees with the value written above the resistor on the circuit board (see Pic 1).

   Do not attempt to measure anything else when in resistance mode, and ensure that there is no voltage in the circuit when measuring resistance.

2. Keep the banana plug of the black lead in the **COM** jack and move the red plug into the hole marked **V**. Connect the clips to the battery terminals on the circuit board which carry the numbers 1 and 35. Make sure that the SW1 switch, on the circuit board, is at the 3V setting. Turn the mulitmetre dial to the **V DC** setting. Make sure that the voltage value measured by the multimetre is approximately equal to the combined voltage of the two batteries (i.e. 3 Volts, see Pic 2). If not check your connections.

   Do not attempt to measure voltages other than those called for in this lab manual. Connection to the power grid is dangerous and is not permitted.

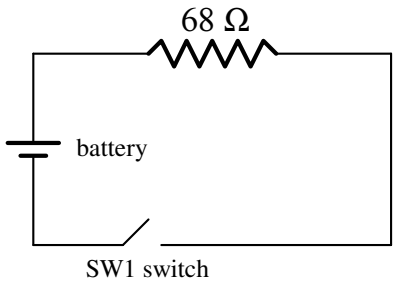
3. To test current measurement, construct the simple circuit shown on the right. In the multimetre, move the red plug into the jack marked **320 mA MAX** and turn the dial to **DC mA** setting (See Pic 3). Note that you can use the SW1 switch to turn the current on/off. If your connection is correct, you should get a current reading in the range of 40 – 45 mA.



Do not place the meter probes across a voltage drop when in current mode. Do not attempt to measure the current flow by placing the meter across the battery. If the meter stops working you may have blown the fuse and should contact the Science Lab.

Part I: Resistance of a Standard Resistor

4. Connect the circuit shown on the right. Following a procedure similar to Step 2 above, measure the voltage across the battery and the voltage across the resistor (see Pic 4). Then, disconnect the multimetre, adjust it (as in Step 3 above) and reconnect it to measure the current flowing in the circuit. Record your measurements in the table below.



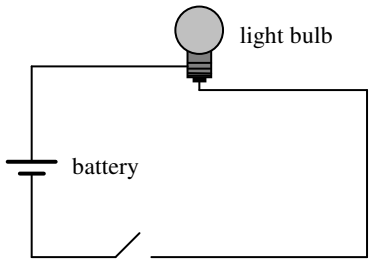
   Always remember to turn the SW1 switch off after each measurement and only turn it on when you are ready for the next one.

5. Add a 10 Ω resistor in series with the first one. Measure the current flowing in the circuit (see Pic 5), the voltage across the battery and the voltage drop across the 68 Ω resistor. Record your measurements in the table below.

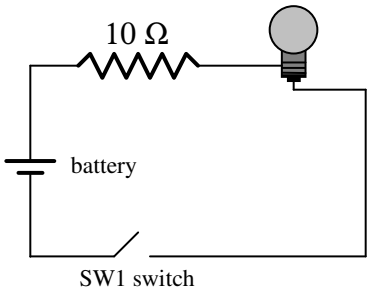
6. Replace the 10 Ω resistor with a 51 Ω resistor and measure current and voltages as in the previous step. Repeat using a 68 Ω and then the 220 Ω resistor. In each case measure the voltage across the battery, the voltage across the 68 Ω resistor and the current flowing in the circuit. Note that for the 220 Ω resistor, current should flow from bin 25 to bin 24 since it is connected to a LED light (see Pic 6). Record all your measurements in the table below.

Resistors (in series)	Voltage across the battery (V)	Voltage across the 68 Ω resistor (V)	Current through the 68 Ω resistor (mA)
68 Ω			
10 Ω + 68 Ω			
51 Ω + 68 Ω			
68 Ω + 68 Ω			
220 Ω + 68 Ω			

Part II: Resistance of the Light Bulb



7. Connect the circuit shown on the right. When you turn the SW1 switch on the bulb should light (see Pic 7). Measure the voltage drop across the light bulb and the current flowing in the circuit. Record your measurements in the table below.
8. Add a 10 Ω resistor in series with the bulb (see Pic 8). Turn the SW1 switch on and measure the voltage across the battery, the voltage across the light bulb and the current flowing in the circuit. Record your measurements in the table below.
9. Replace the 10 Ω resistor with a 51 Ω resistor and measure voltages current as in previous step. Repeat using a 68 Ω and then the 220 Ω resistor (see Pic 9)



Resistor	Voltage across the battery (V)	Voltage across the light bulb (V)	Current through the light bulb (mA)
None			
10 Ω			
51 Ω			
68 Ω			
220 Ω			